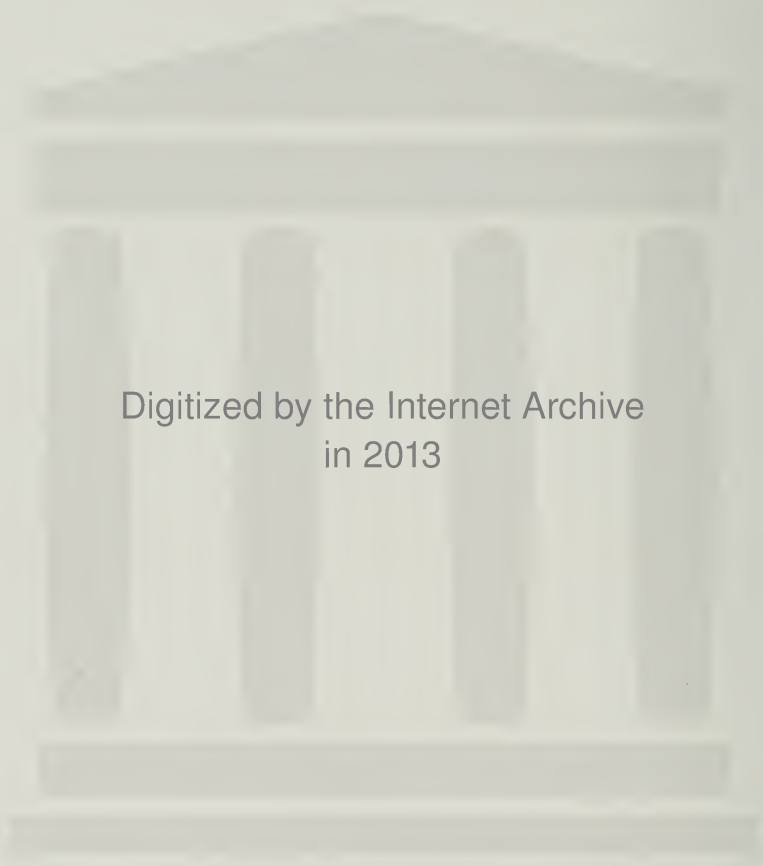


UNIVERSITY OF ILLINOIS CATALOG

Graduate Study in Dentistry,
Medicine, and Pharmacy



1948-1949



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UNIVERSITY OF ILLINOIS
CATALOG

Graduate Study in Dentistry,
Medicine, and Pharmacy



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UNIVERSITY OF ILLINOIS

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(Term 1945-1951)

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HENNING LARSEN, Ph.D., Professor of English, Head of the Department, and Dean of
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HELMUT REHDER, Ph.D., Professor of German, Head of the Department, and Chairman
of the Division of Humanities
WORTH HUFF RODEBUSH, Ph.D., Professor of Physical Chemistry
GLENN WADE SALISBURY, Ph.D., Professor of Dairy Production and Head of the De-
partment
THOMAS CLARK SHEDD, M.S., C.E., Professor of Structural Engineering

STANDING COMMITTEE ON GRADUATE WORK IN DENTISTRY, MEDICINE, AND PHARMACY

ANDREW CONWAY IVY, Ph.D., M.D.,
D.Sc., Chairman
ALLAN GIBSON BRODIE, Ph.D., D.D.S.,
Vice-Chairman
MILAN VACLAV NOVAK, Ph.D., M.D.,
D.Sc., Secretary
GRANVILLE ALLISON BENNETT, M.D.,
A.M.
OTTO ARTHUR BESSEY, Ph.D.
WARREN HENRY COLE, M.D.

NOEL ELMER FOSS, Ph.D.
OTTO FREDERICK KAMPMEIER, Ph.D., M.D.
ROBERT WOOD KEETON, M.D., M.S.
ERIC OLDBERG, Ph.D., M.D.
CARL CURT PFEIFFER, Ph.D., M.D.
ISAAC SCHOUR, Ph.D., D.D.S., D.Sc.
EARL ROY SERLES, Ph.D.
GEORGE EARLE WAKERLIN, Ph.D., M.D.
GEORGE LEWIS WEBSTER, Ph.D.
JOHN BARLOW YOUNG, M.D., M.S.

CALENDAR OF THE GRADUATE COLLEGE

1948 — Fall Quarter

- September 30, Thursday.....Graduate registration. Room 120. 10:00 A.M. to 12:00 M.;
2:00 to 4:00 P.M.
- October 1, Friday.....Graduate registration. Room 120. 10:00 A.M. to 12:00 M.
- October 1, Friday.....Latest date for registration of former students without
penalty.
- October 1, Friday.....Latest date to apply for French and German examinations.
Room 384.
- October 1, Friday.....Latest date to apply for degree to be conferred in December.
Room 384.
- October 11, Monday.....Latest date for change in course of study without fee.
Room 384.
- October 15, Friday.....Language examinations. Room 384. 2:00 P.M.
- October 29, Friday.....Latest date for preliminary examinations (for full residence).
- November 19, Friday.....Latest date for candidates for Ph.D. degree in December
to deposit thesis, file application for degree, and secure
clearance slip. Room 384.
- November 25, Thursday.....Thanksgiving Day.
- November 26, Friday.....Latest date for candidates for M.S. degree in December
to deposit thesis, file application for degree, and secure
clearance slip. Room 384.
- December 3, Friday.....Latest date for finals for Ph.D. degree.
- December 3, Friday.....Latest date for oral examination for candidates for M.S.
degree.
- December 18, Saturday.....Fall quarter ends.

1949 — Winter Quarter

- January 6, Thursday.....Graduate registration. Room 120. 10:00 A.M. to 12:00 M.;
2:00 to 4:00 P.M.
- January 7, Friday.....Graduate registration. Room 120. 10:00 A.M. to 12:00 M.
- January 17, Monday.....Latest date for change in course of study without fee.
Room 384.
- March 1, Tuesday.....Latest date to apply for Graduate College fellowships for
1949-1950.
- March 26, Saturday.....Winter quarter ends.

1949 — Spring Quarter

- March 31, Thursday.....Graduate registration. Room 120. 10:00 A.M. to 12:00 M.;
2:00 to 4:00 P.M.
- April 1, Friday.....Graduate registration. Room 120. 10:00 A.M. to 12:00 M.
- April 1, Friday.....Latest date for registration of former students without
penalty.
- April 1, Friday.....Latest date to apply for French and German examinations.
Room 384.
- April 1, Friday.....Latest date to apply for degree to be conferred in June.
Room 384.
- April 11, Monday.....Latest date for change in course of study without fee.
Room 384.
- April 22, Friday.....Language examination. Room 384. 2:00 P.M.
- April 29, Friday.....Latest date for preliminary examination (for full residence).
- May 20, Friday.....Latest date for candidates for Ph.D. degree in June to
deposit thesis, file application for degree, and secure
clearance slip. Room 384.

May 27, Friday.....Latest date for candidates for M.S. degree in June to deposit thesis, file application for degree, and secure clearance slip. Room 384.

May 30, Monday.....Memorial Day.

June 3, Friday.....Latest date for finals for Ph.D. degree.

June 6, Monday.....Latest date for oral examination for candidates for M.S. degree.

June 17, Friday.....Commencement.

June 18, Saturday.....Spring quarter ends.

1949 — Summer Quarter

June 23, Thursday.....Graduate registration. Room 120. 10:00 A.M. to 12:00 M.; 2:00 to 4:00 P.M.

July 4, Monday.....Independence Day.

July 5, Tuesday.....Latest date for change in course of study without fee. Room 384.

September 17, Saturday.....Summer quarter ends.

Notes

Registrant is classified as a first-year student until he has completed work toward the M.S. degree and as a second-year student until he has passed the preliminary examination.

Examination in one foreign language (French or German) must be passed before residence on second year may be counted. No language is required of M.S. candidates.

It is not the policy to allow more than one re-examination to those failing a language examination.

Two copies of thesis are required of all candidates. For special information concerning thesis form, paper used, etc., see secretary in Room 384.

Candidates for master's degree announce thesis subjects at time of registration subsequent to completion of four units of work. Petition for change of thesis title must be made to the Secretary of the Graduate Committee.

Candidates for Ph.D. degree announce thesis subjects within six weeks after registering for third year in residence (Room 384). Petition must be made to change thesis title (Room 384).

Assistants or others on full-time appointments are allowed a maximum of one unit per quarter; those on half time may register for two units and proportionately more or less depending on fractional time of appointment. Dental and medical students, who qualify for graduate work, may register for two-thirds unit per quarter. Three units per quarter constitute a full-time graduate program. One unit represents a minimum of thirteen clock hours of laboratory work per week for one quarter.

Oral examinations of candidates for the M.S. degree as well as preliminary and final examinations for Ph.D. candidates will be scheduled only during the Fall and Spring quarters except when special arrangements are made with the Secretary of the Graduate Committee for special cases involving duress.

Four units are required in a minor for the Ph.D. degree. None is required of candidates for the M.S. degree.

HEADS OF DEPARTMENTS GIVING GRADUATE WORK

Anatomy.....	OTTO FREDERICK KAMPMEIER
Bacteriology.....	MILAN VACLAV NOVAK
Biological Chemistry.....	OTTO ARTHUR BESSEY
Chemistry.....	GEORGE LEWIS WEBSTER
Clinical Science.....	ANDREW CONWAY IVY
Dental Histology.....	ISAAC SCHOUR
Dermatology.....	FRANCIS EUGENE SENEAR
Medicine.....	ROBERT WOOD KEETON
Neurology and Neurological Surgery.....	ERIC OLDBERG
Obstetrics and Gynecology.....	FREDERICK HOWARD FALLS
Ophthalmology.....	WILLIAM FRANKLIN HUGHES
Oral and Maxillofacial Surgery.....	BERNARD GEORGE SARNAT
Orthodontia and Pedodontia.....	ALLAN GIBSON BRODIE
Otolaryngology.....	FRANCIS LOEFFLER LEDERER
Pathology.....	GRANVILLE ALLISON BENNETT
Pediatrics.....	HENRY GEORGE PONCHER
Pharmacognosy.....	FRANK THOMAS MAHER
Pharmacology.....	CARL CURT PFEIFFER
Pharmacy.....	EARL ROY SERLES
Physical Medicine.....	HERBERT WORLEY KENDALL
Physiology.....	GEORGE EARLE WAKERLIN
Psychiatry.....	FRANCIS JOSEPH GERTY
Radiology.....	ROGER ALLEN HARVEY
Surgery.....	WARREN HENRY COLE

THE TEACHING FACULTY FOR GRADUATE WORK IN DENTISTRY, MEDICINE, AND PHARMACY

1948-1949

- *ALBERT BACHEM, Ph.D., Professor of Biophysics
- *PERCIVAL BAILEY, Ph.D., M.D., Distinguished Professor of Neurology and Neurological Surgery
- JAMES ARTHUR BAIN, Ph.D., Research Associate in Pharmacology
- *GRANVILLE ALLISON BENNETT, M.D., A.M., Professor of Pathology, Head of the Department, and Pathologist-in-Chief in the Research and Educational Hospitals
- *OLAF BERGEIM, Ph.D., Professor of Biological Chemistry
- *OTTO ARTHUR BESSEY, Ph.D., Professor of Biological Chemistry and Head of the Department
- MRS. CARROLL LA FLEUR BIRCH, M.D., M.S., Associate Professor of Medicine
- GERHARDT VON BONIN, M.D., Professor of Anatomy
- *ALLAN GIBSON BRODIE, Ph.D., D.D.S., Professor of Orthodontia, Head of the Department, and Dean of the College of Dentistry
- *PAUL CLANCY BUCY, M.D., M.S., Professor of Neurology and Neurological Surgery
- *WALTER JOHN RICHARD CAMP, Ph.D., M.D., Professor of Pharmacology
- HUGH THOMPSON CARMICHAEL, M.D., C.M., M.S., Professor of Psychiatry
- HUBERT RALPH CATCHPOLE, Ph.D., Assistant Professor of Pathology
- *FREMONT AUGUSTUS CHANDLER, B.S., M.D., Professor of Orthopaedic Surgery, Head of the Department, and Director of the Illinois Surgical Institute for Children
- *WARREN HENRY COLE, M.D., Professor of Surgery and Head of the Department
- *SIDNEY PAUL COLOWICK, Ph.D., Associate Professor of Biological Chemistry
- HUGH LESLIE DAVIS, Ph.D., Associate Professor of Chemistry
- *DAVID JOHN DAVIS, Ph.D., M.D., Dean of the College of Medicine and Professor of Pathology, *Emeritus*
- *FREDERICK HOWARD FALLS, M.D., M.S., Professor of Obstetrics and Gynecology and Head of the Department
- EDMUND FRANCIS FOLEY, M.D., Professor of Medicine
- GEORGE FRANCIS FORSTER, Ph.D., Assistant Professor of Bacteriology
- *NOEL ELMER FOSS, Ph.D., Professor of Pharmacy and Assistant Dean of the College of Pharmacy
- *ISIDORE GERSH, Ph.D., Associate Professor of Pathology
- *FRANCIS JOSEPH GERTY, B.S., M.D., Professor of Psychiatry and Head of the Department
- FREDERIC ANDREWS GIBBS, A.B., M.D., Associate Professor of Psychiatry
- *MORTON IRWIN GROSSMAN, Ph.D., M.D., Associate Professor of Clinical Science
- ROGER ALLEN HARVEY, M.D., M.S., Professor of Radiology and Head of the Department
- *GEORGE MARVIN HASS, M.D., Professor of Pathology (Rush)
- *RUSSEL DORR HERROLD, M.D., Clinical Associate Professor of Surgery
- JULIUS HAYS HESS, M.D., Professor of Pediatrics, *Emeritus*
- FORD KIMMEL HICK, Ph.D., M.D., Associate Professor of Medicine
- MAX KENNETH HORWITT, Ph.D., Assistant Professor of Biological Chemistry
- WILLIAM FRANKLIN HUGHES, JR., A.B., M.D., Professor of Ophthalmology and Head of the Department
- *RAYMOND CLIFFORD INGRAHAM, Ph.D., Associate Professor of Physiology
- *ANDREW CONWAY IVY, Ph.D., M.D., Distinguished Professor of Physiology, Head of the Department of Clinical Science, and Vice-President in Charge of the Chicago Professional Colleges
- RICHARD LEOS JENKINS, M.D., Clinical Associate Professor of Psychiatry
- CLARENCE ALBERT JOHNSON, Ph.D., Assistant Professor of Biological Chemistry
- NORMAN ROSS JOSEPH, Ph.D., Assistant Professor of Chemistry
- *OTTO FREDERIC KAMPMEIER, Ph.D., M.D., Professor of Anatomy and Head of the Department
- *ROBERT WOOD KEETON, M.D., M.S., Professor of Medicine and Head of the Department
- JOHN EMERSON KEMPF, M.D., Associate Professor of Bacteriology
- ROBERT GEORGE KESEL, D.D.S., M.S., Professor of Applied Materia Medica and Therapeutics and Head of the Department

* Approved for full graduate faculty standing.

- *ERNST RUDOLPH KIRCH, Ph.D., Associate Professor of Chemistry
 CECIL ALEXANDER KRAKOWER, M.D., C.M., Professor of Pathology and Associate Pathologist in the Research and Educational Hospitals
 ROBERT HENRY KREHBIEL, Ph.D., Associate Professor of Anatomy
 JULES HILBERT LAST, Ph.D., M.D., Assistant Professor of Pharmacology
 FRANCIS LOEFFLER LEDERER, M.D., Professor of Otolaryngology and Head of the Department; Director of Education (ENT), Otolaryngologist-in-Chief in the Illinois Eye and Ear Infirmary
 BEN WILLIAM LICHTENSTEIN, M.D., M.S., Associate Professor of Neurology
 LOUIS ROBERT LIMARZI, M.D., M.S., Assistant Professor of Medicine
 *DOUGLAS ARCHIBALD MACFADYEN, M.D., A.M., Professor of Biological Chemistry (Rush)
 ROLAND PARKS MACKAY, A.B., M.D., Professor of Neurology
 *FRANK THOMAS MAHER, Ph.D., M.D., Professor of Pharmacognosy and Head of the Department
 MAURY MASSLER, D.D.S., M.S., Associate Professor of Pedodontia
 *WARREN STURGIS MCCULLOCH, M.D., A.M., Professor of Psychiatry and Neurophysiologist
 LADISLAS JOSEPH MEDUNA, M.D., Associate Professor of Psychiatry
 ESTHER MEYER, Ph.D., Assistant Professor of Bacteriology
 ALEXANDER JOHN NEDZEL, M.D., M.S., Associate Professor of Pathology
 *MILAN VACLAV NOVAK, Ph.D., M.D., Professor of Bacteriology and Head of the Department
 *ERIC OLDBERG, Ph.D., M.D., Professor of Neurology and Neurological Surgery and Head of the Department
 EDITH ELIZABETH PAINTER, Ph.D., Assistant Professor of Physiology
 *CARL CURT PFEIFFER, Ph.D., M.D., Professor of Pharmacology and Head of the Department
 ISADORE PILOT, B.S., M.D., Associate Professor of Medicine
 *HENRY GEORGE PONCHER, M.D., Professor of Pediatrics and Head of the Department
 CHARLES BERNARD PUESTOW, Ph.D., M.D., Clinical Professor of Surgery
 BEN ZION RAPPAPORT, M.D., M.S., Clinical Associate Professor of Medicine
 *CARLOS ISAAC REED, Ph.D., Professor of Physiology
 SOL ROY ROSENTHAL, Ph.D., M.D., Assistant Professor of Bacteriology
 ADOLPH ROSTENBERG, JR., M.D., M.S., Associate Professor of Dermatology and Associate Director of Clinical Investigation in the Allergy Unit of the Department of Dermatology
 BERNARD GEORGE SARNAT, M.D., D.D.S., Professor of Oral and Maxillofacial Surgery and Head of the Department
 ALFRED ALBERT SCHILLER, M.D., M.S., Assistant Professor of Physiology
 *ISAAC SCHOUR, Ph.D., D.D.S., Professor of Histology, Head of the Department, and Associate Dean of the College of Dentistry in Charge of Postgraduate Studies
 *FRANCIS EUGENE SENEAR, M.D., M.S., Professor of Dermatology and Head of the Department
 *EARL ROY SERLES, Ph.D., Professor of Pharmacy and Dean of the College of Pharmacy
 *HOWARD JOHN SHAUGHNESSY, Ph.D., Professor of Bacteriology
 PARKE HARVEY SIMER, Ph.D., Professor of Anatomy
 *GÉZA DE TAKATS, M.D., M.Surg., Clinical Associate Professor of Surgery
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 *KLAUS ROBERT UNNA, M.D., Associate Professor of Pharmacology
 CORNELIUS WILLIAM VERMEULEN, A.B., M.D., Clinical Associate Professor of Surgery
 RALPH FERDINAND VOIGT, Ph.D., Associate Professor of Pharmacognosy and Pharmacology and Director of the Drug Plant Experiment Station
 *GEORGE EARLE WAKERLIN, Ph.D., M.D., Professor of Physiology and Head of the Department
 *GEORGE LEWIS WEBSTER, Ph.D., Professor of Chemistry and Head of the Department
 JOSEPH PETER WEINMAN, M.D., Associate Professor of Histology
 *WILLIAM HENRY WELKER, Ph.D., Professor of Biological Chemistry, *Emeritus*
 WILLIAM VICTOR WHITEHORN, M.D., Assistant Professor of Physiology
 *JOHN BARLOW YOUNG, M.D., M.S., Professor of Medicine and Dean of the College of Medicine
 ARNOLD ALBERT ZIMMERMANN, D. ès S., Professor of Anatomy

THE GRADUATE COLLEGE

History and Organization

The University of Illinois offered facilities for advanced study and research in various lines as early as 1872. Organized graduate instruction, however, under the name of the Graduate School, was first undertaken in 1892. In 1894, the administration of the school was vested in the Council of Administration, and the Vice-President of the University became Dean of the School. In 1906 the Graduate School was organized as a separate faculty. The name was changed to the Graduate College in 1947.

Graduate work at the professional colleges has been in progress since 1924 when the first appointments to the graduate faculty were made.

By action of the Trustees, the teaching faculty of the Graduate College includes all members of the University faculty who give instruction in approved graduate courses. At the Chicago Professional Colleges, graduate college affairs are in charge of the Committee on Graduate Work. Recommendations concerning graduate faculty appointments and approval of graduate courses and curricula leading to graduate degrees are submitted to the Executive Faculty of the Graduate College at Urbana for final action.

Purpose and Standards

Graduate work in medicine, dentistry, and pharmacy is not intended for individuals seeking brief postgraduate reviews, refresher courses, or demonstrations. Opportunities for this kind of work are available in the postgraduate curricula regularly offered in each of the professional colleges.

Graduate work is a training program for investigators and teachers leading to advanced degrees which are based mainly on the student's research ability and a high degree of excellence of knowledge in his chosen field of endeavor. Incidental to such a program is the training of fully certified specialists for professional practice.

High standards of admission are maintained and careful selection and individual approval of faculty members is made to supply qualified advisers to graduate students; adequate laboratory, clinical, and library facilities are available. Rigid tests in courses and examinations showing evidence of the ability for productive research are requirements for normal progress toward a graduate degree.

In clinical branches, the M.S. degree indicates primarily scientific proficiency. The candidate is expected to give evidence that he is competent to begin practice of a clinical specialty in a scientific manner. The Ph.D. degree in clinical subjects is awarded only to those who have demonstrated, in addition to the M.S. requirements stated above, the evidence of definite ability to advance medical science through original investigation.

Library

The Library of Medical Sciences at the Chicago Professional Colleges ranks as one of the largest university medical libraries in the United States with a total, as of January, 1948, of 87,000 volumes, of which 59,000 are bound periodicals and 28,000 are books. The library is now receiving 925 current periodicals. The book

collection in the library is on open shelves; there are no restrictions concerning the use of the stacks. The library is used not only by staff members and students of the University, but by other medical schools, hospitals, and professional men and women throughout the Chicago area. Interlibrary Loan Service permits extensive loan service with other libraries in the country and is of great value to the research worker.

Reference collections in the library include the important American and English encyclopedic works; German *Handbücher* for most of the medical fields; scientific and technical language dictionaries; periodicals covering not only medicine, dentistry, and pharmacy, but allied sciences as well; indexes; sets of abstracts; and pharmacopoeias, both American and foreign.

The Library of Medical Sciences has made a special effort to fill the files of foreign periodicals for the war years. With the exception of German journals, nearly complete sets of most of the foreign titles which continued publication during the war have been received. In addition, 900 volumes, not including periodicals, of French, German, and Italian medical works, have come in through the Library of Congress cooperative project for the acquisition of wartime publications.

Museums

The College of Dentistry has a museum of dental anatomy and comparative odontology containing 1,500 specimens.

The College of Medicine has two museums. The Anatomy Museum includes gross anatomy, histology, embryology, and neurology. The Pathology Museum includes general, special, and medico-legal specimens.

The College of Pharmacy has a museum including more than 10,000 specimens of crude drugs and technical products. One collection is classified according to botanical origin and is arranged in cases illustrating habitat, commerce, etc. Another collection contains every drug officially listed in the *United States Pharmacopoeia* since 1820 and in the *National Formulary* since 1888.

Admission

Admission to the Graduate College may be granted to graduates of institutions whose requirements for the bachelor's degree are substantially equivalent to those of the University of Illinois. Applicants must have a scholastic average of at least 3.5, or its equivalent on the University of Illinois scale,¹ in their undergraduate work in order to qualify for admission. For medical or dental students, the average is based on pre-professional and professional school grades. Applicants who do not have the 3.5 average in all courses, but who have maintained such an average in the field chosen for graduate work, may be admitted on written recommendation of the head of the department concerned, with the approval of the Committee on Graduate Work in Dentistry, Medicine, and Pharmacy. In all such cases, admission will be to special graduate status. Admission to the Graduate College does not imply admission to candidacy for an advanced degree, and gives no right or claim to be so admitted; a mere accumulation of "credits" or "grades" is not sufficient.

Admission to graduate courses may be granted only to those who have had the requisite undergraduate work in those courses or departments.

Admission to work toward a graduate degree (M.S. or Ph.D.) in the clinical

¹ Averages are computed on the following basis: A = 5; B = 4; C = 3; D = 2; E (failure) = 1.

departments is limited to those who have the bachelor's degree in arts or science or its equivalent and who have been awarded the M.D. degree.

In the fundamental basic sciences (anatomy, bacteriology, biological chemistry, pathology, pharmacology, and physiology), properly qualified students are admitted without the M.D. degree.

Application blanks for admission may be secured from the Examiner and Recorder for the Colleges in Chicago at 1853 West Polk Street, Chicago 12, Illinois. Each applicant must submit with his application for admission an official transcript of his college record. After approval by the Examiner and Recorder, the student must apply to a member of the graduate faculty, usually the head of the department, for acceptance. If accepted, he is assigned to an adviser and may register for courses approved by his adviser. Final admission is dependent on his passing a physical examination conducted by the University Health Service.

Registration and Program of Studies

Registration.—Each graduate student must register at the beginning of each quarter. The registration of a new student may be accepted at any time provided the student is prepared to take up courses actually under way. Credit towards the fulfillment of the residence requirement dates, however, from time of registration and not from the beginning of the quarter or year in which the student enters. Registration for courses requires the signature of the instructor involved and the major adviser. The number of units for which the candidate registers is determined on the basis of thirteen hours of laboratory work or its equivalent per week for one unit of credit per quarter. One-half unit may be taken as the minimum per quarter.

The first registration, or that on entrance, is permitted only after the student's application for admission to the Graduate College, setting forth his educational attainments, has been duly approved and he has been accepted by a member of the graduate faculty who will discuss with the student a program of study and research for the period of residence.

Registration, including the payment of fees, must be completed by the close of the registration days of the Graduate College. A fee of five dollars will be charged of former University of Illinois students for late registration.

Medical Students and Graduate Study.—If at the beginning of the second quarter of his second year, a student in the College of Medicine has been in residence at least one year and has maintained an average of at least 85 per cent in all work in Medicine, he may be permitted to register for two-thirds unit per quarter which may count for residence for a master's degree. Only students of excellent record will be allowed this privilege. Registration may continue in following quarters as long as an 85 per cent average is maintained in the medical curriculum.

Medical students who take advantage of this opportunity become familiar with the methods of research and advanced study.

Changes in Study-lists.—A graduate student is expected to plan his work so carefully that changes in his study-list during the quarter will not be necessary. When a change seems advisable, however, it may be permitted without fee if made within the time limit indicated on the Graduate College calendar. After that date a fee of one dollar is charged for each change, except that the total charge for rearrangement authorized on any one change slip shall not exceed two dollars.

Character of Graduate Work

The principal aims of graduate study are the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to exhibit a proficiency in his subject as well as in related fields of work. The graduate student is not expected to get from lecture and laboratory courses all the knowledge and training necessary to meet the requirements for the degree.

Students on the Staff.— Assistants and others on the University staff who undertake to do graduate work are permitted to take an amount of work determined by the terms of their employment. Such a student, if required by his engagements to teach more than five classes a week or to have laboratory work or supervision exceeding ten hours a week, may not receive his master's degree at the end of one year, nor his doctor's degree at the end of three. Full-time assistants are allowed a maximum of one unit of work per quarter. Half-time assistants may register for two units, and others may obtain credit for the number of units proportionate to their percentage time of employment. Full-time research fellows may register for a maximum of three units per quarter. A petition for an exception to these general provisions must be approved by the Secretary of the Graduate Committee authorized by the Dean of the Graduate College prior to registration and reported to the Provost of the University. Approval for more than the maximum number of units will be considered only in unusual circumstances.

Residence and Work Done Elsewhere.— Continuous residence and study are required of all members of the Graduate College unless they are granted leave of absence by the Committee on Graduate Work in Medicine, Dentistry, and Pharmacy for the purpose of carrying on elsewhere studies or investigations in the line of work for their degrees. In general, graduate credits are not transferred.

Members of the staff who have done graduate work in approved institutions elsewhere may secure credit not to exceed four units towards the master's degree by passing examinations in that work. Admission to such examinations requires the prior approval of the Committee on Graduate Work. They may complete the work for the degree by securing at least four units more while registered in the Graduate College for not less than one academic year.

Method of Computing Residence.— Credit for a full year of graduate work means that the student has during that time devoted all his working time and energy to study of a graduate grade. Second-year and third-year students shall register in terms of units. One unit is equivalent to thirteen laboratory hours per week per quarter. For each course with fixed credit or with variable credit within fixed limits, the registration shall be for such credit as is determined in the usual way for such courses. The registration for a full-time student shall be for three units; for a part-time student the registration shall ordinarily be on the basis of such fraction of three units as corresponds to the time given to study. It should be clearly understood, however, that for second-year students a mere accumulation of unit credits will not, in itself, entitle a student to the privilege of taking preliminary examinations, and that for third-year students such an accumulation of credits will not, in itself, entitle the student to admission to the final examination. Work toward the M.S. degree must be completed within five

years and for the Ph.D. within ten years from the date of first registration in the Graduate College.

Withdrawal.—If after registration a graduate student wishes to withdraw from any course or to add other work, he must first secure the necessary papers from the office of the Secretary of the Graduate Committee. If he wishes to withdraw from the University he must also get clearance papers at this office.

Grades.—Students' work is graded in five classes: A, B, C, D, and E. The last indicates a failure. "D" indicates unsatisfactory, though passable, work.

A student who receives two units of a grade below "B" during his first year of graduate work may not complete the first year of residence by carrying the minimum program of nine units for the master's degree. Three units of a grade below "B" disqualifies a student for further work at the Graduate College level.

A failure or absence from examination in any course may prevent the conferring of the degree and failure in any course in the major field precludes the conferring of the degree in the same year.

Attendance at Commencement Required.—Unless excused by the Dean of the Graduate College, candidates for graduate degrees are required to attend Commencement exercises.

The Degree of Master of Science

Amount of Work Required.—Candidates for the degree of Master of Science are required to do at least one full year of work in residence, including a thesis. Three units constitute a normal quarter program for a master's degree. A minimum of nine units must be completed for the degree. Only superior students are permitted to secure a degree with this minimum program. In all cases, the student must satisfy the duly approved conditions set by his major department and major adviser. At least four units must be earned in research courses.

Unless otherwise permitted, every student must take during each quarter, at least one course numbered 300 and upwards.

Unless consent has been obtained from the Graduate Committee, all work must be conducted at the University.

In the first year of his graduate study, each student is required to attend a minimum of four formal class, lecture, seminar, or laboratory exercises a week. He may not attend more than twelve a week without special permission.

Majors and Minors.—A candidate for a master's degree may do all his work in one subject, or he may select a major and one minor. A major or a minor denotes the field of knowledge of a department or such part thereof as constitutes a separate and independent division of that field. For a master's degree, a major is at least half the work or a minimum of four units for one year. Less than one unit may not be counted as satisfying the requirements of a minor without the approval of the department concerned.

Foreign Language.—The ability to use one or more of the modern languages ordinarily studied in the undergraduate curriculum is desirable for all candidates for the master's degree. No student will be permitted to acquire residence toward the second year for the doctorate until he has passed the preliminary examination in at least one of these languages.

Master's Thesis.—Each candidate for a master's degree is required to present two copies of a thesis on some subject approved by the professor in charge

of his major work. Such approval must be secured and the subject of the thesis filed at the office of the Graduate College not later than the beginning of the second half-year of residence.

The thesis must be typewritten on "thesis paper," and the title-page must be printed. Two copies of the thesis in its final form must be submitted to the Secretary of the Committee on Graduate Work on or before the date indicated on the calendar. A committee to examine the thesis and to conduct the oral examination will be appointed to approve the thesis and recommend the student to the Dean's office for the degree indicated at least two weeks before the date on which the degree is to be conferred. No article prepared for another use or previously published will be accepted as a thesis. Permission for the publication of the material of a master's thesis need not be obtained from the Secretary of the Graduate Committee before such publication is carried out.

Under proper conditions, a student may be permitted to complete the last fourth of his work, if devoted to his thesis, under leave of absence. To get such permission, the student must have secured proper credit for at least six units, must petition for the privilege, must submit to the Committee on Graduate Work an outline of the proposed investigation approved by the head of his major department, and must submit satisfactory evidence that adequate facilities are available to him at the place where he intends to do the proposed work. Approval on all these points must be obtained one collegiate year before the thesis is due. Immediately following approval, the student must register and pay the same tuition fee as a regular student in residence.

Examination.—A final oral examination by a committee of the faculty is required of all candidates for master's degrees. Arrangements for this examination should be made at the time the thesis is submitted. Oral or written examinations in addition to the above may be given at the discretion of the department head.

Applications for Degrees.—Each candidate for the degree of M.S. shall file an application for the degree on a blank provided for the purpose by the Secretary of the Graduate Committee. For the dates of application and deposition of theses, consult the calendar.

The Degree of Doctor of Philosophy

Admission.—Graduate students desiring admission to the second year of graduate study must file an application with the Secretary of the Graduate Committee. No student will be admitted to the second year of graduate work without the recommendation of a committee of three appointed to interview the prospective student and to pass upon an outline of his Ph.D. program as prepared by the student's major adviser. This committee is appointed by the Secretary of the Committee on Graduate Work in Dentistry, Medicine, and Pharmacy.

Major and Minor Subjects.—A student in the Graduate College who desires to become a candidate for the degree of Doctor of Philosophy is required to earn a total of eighteen units beyond the M.S. degree, nine units of which must be in research courses. He must pursue a major subject in the department in which his research lies. He is also required to choose one minor subject, or he may choose two. If one minor only is chosen, it must be taken in a department

¹ No other will be accepted by the Dean. "Instructions for the Preparation of Theses" may be obtained from the Secretary of the Committee on Graduate Work in Dentistry, Medicine, and Pharmacy.

of study other than that of the major, and credit for it may be earned by work representing not less than four units, or one-sixth of the total residence required for the doctorate. If two minors are chosen, one must be a subject closely related to the major. With the approval of the adviser, it may be a division of the major field of study. The other minor (not less than two units) must, in that case, be taken in a department of study other than that of the major. Units earned in the minor field while pursuing work toward the M.S. degree may be counted in the total required for a minor. A student whose major is in a clinical department must select a minor in a basic science subject.

The preliminary examination in major and minor subjects may not be taken until the minor work has been completed.

Period of Study.—The normal minimum period of study required for the degree of Ph.D. is two years beyond the M.S. degree during which the student is required to devote all his working time to his studies. Both years must be spent in residence at some accredited educational institution. If the student has obtained his M.S. degree at the University of Illinois either the first or the last one of the two may be spent *in absentia* if approved by the Graduate Committee. The degree is conferred, however, not for residence during a certain period, but for scholarly attainments and power of investigation, as proved by a thesis and examination.

Work Done in Other Universities.—Credit for graduate work done in other universities is not transferred. However, it may be accepted on petition to the Graduate Committee as equivalent to work at the University of Illinois, provided the institution in which it was done is of high standing.

Examinations in Languages.—The student will be required to demonstrate his ability to read French and German and other languages needed in his work. (In special cases the Graduate Committee, upon recommendation of the student's adviser, may substitute for either one of the required languages some other language which can be shown to be more useful in that student's professional studies.) No student will be permitted to acquire residence toward the second year of graduate study until he has passed the examination in at least one of these languages. Both the examination in French and in German must be passed before the student is admitted to the preliminary examination in his major and minor subjects. Arrangements for the language examination should be made on registration day.

Examinations in Major and Minors.—Toward the end of his second year of study, a student who wishes to become a candidate for the Ph.D. degree must submit to a preliminary examination. This examination is intended to test the student's knowledge of the fields of his major and minor subjects of study and to determine whether he is prepared for the final year of work for the doctorate. It extends to the whole field of study of the candidate. It will not be confined to the courses which the candidate has attended in the University of Illinois only if he has done part of the work elsewhere, nor to the field covered by the courses specifically taken in this or other universities. It will be conducted to determine whether the candidate has a satisfactory grasp of his major subject as a whole and a general acquaintance with the fields of knowledge represented by his course of study. Familiarity with those phases of the medical sciences essential to proficiency in the student's major specialty is required. It is partly oral but may be wholly so.

The student will not be admitted to his preliminary examination until the faculty is satisfied that he has finished substantially the equivalent of two years of graduate work. He must do a full year's graduate work between his preliminary examination and the completion of his work for the doctorate.

Final Examination. — At least two weeks before the time when the degree is conferred, the candidate must submit to a final examination given by a committee appointed by the Secretary of the Graduate Committee. This examination is primarily on the research work of the student as embodied in his thesis but is not confined to that. The final examination may not be divided. It must be taken all at one time, though it requires several sessions.

If, after having passed his preliminary examination, he fails in the third year of his study to meet the expectations of the professors in charge of his work or in any way fails to maintain the standard of scholarship and power of research expected of him, he may be refused admission to the final examination.

Other Examinations. — Before the candidate is admitted to the final examination and the defense of his thesis, he may be required to take any other examination, oral or written, which is thought proper by the various departments in which he has studied.

The above examinations are in addition to those in the courses for which the student is registered. These must be taken at times for which they are set in the examination schedule.

Thesis. — The power of independent research must be shown by the production of a thesis on some topic connected with the major subject of study. The candidate is expected to defend his thesis or dissertation before the members of the faculty, or as many of them as may wish to question him about it, in connection with his final examination.

The subject of the thesis should be chosen not later than the end of the second year of residence.

Two typewritten copies of the complete thesis, *on thesis paper*, and in final form must be deposited in the office of the Secretary of the Committee on Graduate Work for presentation to the examining committee not later than two weeks prior to the final examination, and not less than four weeks before the time when the degree is conferred. At the same time, the candidate must deposit with the Secretary a manuscript of the essential part or an abstract or a digest of his thesis, in condition for publication at a cost not to exceed seventy-five dollars. The manuscript must be sufficient to show the method followed, the evidence used, and the conclusions reached in the investigation, and it must bear the approval of the department.

The candidate must deposit in the Business Office before graduation the sum of seventy-five dollars out of which the University will print at least one hundred copies of this manuscript for circulation by the University, unless the thesis, entire or in abbreviated form, is published by the author or is accepted for publication by a standard journal or publisher within a year from the date of graduation. In the latter event, and after one hundred copies have been presented to the University by the writer, the University will arrange the printing of title-pages and certain other data. The cost of this printing will be deducted from the seventy-five-dollar deposit, and the balance will be returned.

The typewritten and printed forms of the thesis must comply with the regulations given in "Instructions for the Preparation of Theses," copies of which may be obtained from the Secretary of the Committee on Graduate Work.

Fellowships and Assistantships

Research Fellowships.—A number of research fellowships are awarded annually in the fields of dentistry, medicine, and pharmacy at stipends of \$1,200 to \$1,800 for the calendar year and with exemption of tuition fees. Fellows are eligible for reappointment in competition with new applicants.

Candidates for these fellowships must have completed training acquired in any one of the following ways, or the equivalent thereof:

(1) Work leading to the B.S. and M.D. degrees. (In some instances the candidates would have the M.S. degree or an additional year or two of hospital training beyond the intern year.)

(2) Work leading to the B.S., M.S., and D.D.S. degrees.

(3) Work leading to the B.S. or A.B. degree in a four-year collegiate course and to the D.D.S. degree.

(4) Work leading to the B.S., D.D.S., and M.D. degrees.

Candidates should indicate the field of research in which they are interested and submit complete transcripts of their scholastic credits, together with the names of three former science teachers as references. March 1 is the deadline for acceptance of applications.

Applications should be mailed to the Secretary of the Committee on Graduate Work in Dentistry, Medicine, and Pharmacy, 1853 West Polk Street, Chicago 12, Illinois.

Graduate Assistantships.—A number of departments offer half-time assistantships carrying an annual stipend of \$1,200. Applicants should apply directly to the department head after ascertaining their eligibility for graduate work.

Walgreen Fellowship in Pharmacy.—One graduate fellowship of \$1,000 for work leading to the degree of Doctor of Philosophy in Chemistry or Pharmacognosy and Pharmacology is offered annually by the Graduate College through the College of Pharmacy. The stipend is paid in the form of a monthly salary, but no teaching or technical services are required.

Candidates for this fellowship should possess a Master of Science degree, preferably in some field of pharmaceutical endeavor, a reading knowledge of German and French, and should have demonstrated an ability to conduct independent research.

Application blanks may be obtained from University of Illinois College of Pharmacy, 808 South Wood Street, Chicago 12, Illinois.

Fees

Students in the Graduate College are subject to the regulations governing fees for each of the following:

Tuition Fee.—The tuition fee in the Graduate College is \$12 per unit for residents of Illinois, or \$24 per unit for non-residents.

Laboratory, Library, and Service Fee.—In laboratory and dispensary courses, a fee of \$8 per unit of credit is charged.

Illini Union Service Charge.—All students registering for resident work, except those who are members of the University staff and others who are registered for not more than one unit of graduate work, are assessed each quarter an Illini Union service charge of \$3.50.

Late Registration Fee.—Former students who register after the regular registration days in any quarter pay a late registration fee of \$5.

Change of Study-list Fee.—For every change slip issued later than noon on the tenth day following the regular registration date, the fee is \$1.

Transcript Fee.—Each student who has paid all the University fees is entitled to receive, without charge, one transcript of his record. For each additional transcript, the fee is 50 cents.

Service Charge for Deferred Fees.—A service charge of ten per cent of the amount of fees deferred, but not to exceed \$2 a quarter, is assessed for the privilege of deferring fees. If deferred fees are paid in full within ten days after registration, the service charge is refunded except that a minimum service charge of \$1 is retained by the University in all cases. The service charge for deferring fees and all charges from previous semesters must be paid on the day of registration.

Fee in Orthodontia and Pedodontia.—For the graduate course in Orthodontia and Pedodontia, in preparation for the practice as a specialty, the quarterly tuition fee is \$100. (No extra fee will be assessed candidates for the master's degree for an extra quarter in Orthodontia 401 or Pedodontia 403.)

Fees for Persons on the University Staff.—Persons on the academic and administrative staffs of the University in any capacity, or on scholarship or fellowship appointment in the Graduate College, or on permanent employment on the nonacademic staff may register in University courses for which they are eligible for admission without payment of the tuition fee and the laboratory fee, provided their annual salary is at the rate of \$2,400 a year or less for full-time employment. (Nonacademic employees must secure the approval of the head of their department or division and the Nonacademic Personnel Office.)

Thesis Deposit Fee.—Candidates for the Doctor of Philosophy degree deposit \$75 in the Business Office at the time the thesis is presented. The cost of printing the title-pages and certain other data will be deducted from this deposit, and the balance will be refunded on presentation of one hundred copies of the thesis to the University.

GRADUATE COURSES IN DENTISTRY, MEDICINE, AND PHARMACY

All courses have certain prerequisites for admission. A student who wishes to enter a particular course must satisfy the department concerned that he has had, either at the University of Illinois or elsewhere, the necessary preparation for admission to the course. The credit value of graduate courses is given in units. Quarters in which courses are taught are indicated by F, W, Sp, or S representing fall, winter, spring, and summer, respectively.

ANATOMY

301-304. HUMAN ANATOMY.—To insure correlation and unity in presentation of the subject matter, the major divisions, Gross Anatomy, Histology, Embryology, and Neuro-anatomy, are merged into a single course extending continuously through three quarters. Credit toward graduation is not allowed for any one quarter separately. The total time, 612 hours, would include the time (approximately 20 hours) for oral, practical, and written mid-quarter and final examinations. It is apportioned approximately as follows: Regional and Systematic Anatomy, 280

hours; Histology, 140 hours; Embryology (including histogenesis), 80 hours; Neuro-anatomy (including sense organs), 80 hours; Roentgen Anatomy and introductory clinical demonstrations presented by selected members of clinical departments and designed to illustrate to the beginner the applications of anatomical knowledge in medical and surgical practice, 32 hours. Approximately three-quarters of the time of the course is given to laboratory work, and the remaining one quarter to lectures, demonstrations, and quizzes. F, W, Sp. Two units per quarter. Professors KAMPMEIER, VON BONIN, SIMER, and HARVEY (cooperating in Roentgen Anatomy), Associate Professor KREHBIEL.

401. **ADVANCED ANATOMY.**—The work may take the direction either of macroscopic or of microscopic anatomy or of both according to the student's major problem—in macroscopic anatomy, a detailed redissection of the human body, or any of its parts; in microscopic anatomy (embryology, cytology, histology, etc.), a consideration of morphological changes in the organism which are directly correlated with normal processes, such as reproduction, differentiation, nutrition, growth, variation, regulation, regeneration, activity, secretion, rest, fatigue, senility. (Work in the laboratory for tissue culture in association with Associate Professor SIMER and Assistant Professor ZECHEL). Course designed for students choosing anatomy as a minor and for students preparing for individual research in anatomy. Time to be arranged. One to two units. Professors KAMPMEIER, VON BONIN, and ZIMMERMANN, Associate Professors SIMER and KREHBIEL.
493. **INDIVIDUAL RESEARCH.**—In embryology, cytology and histology, neurology, anthropology and biometrics, experimental morphology, functional and applied anatomy. F, W, Sp, S. One to three units. Professors KAMPMEIER, VON BONIN, and ZIMMERMANN, Associate Professors KREHBIEL and SIMER.

BACTERIOLOGY

320. **BACTERIOLOGY AND RELATED MICROBIOLOGY.**—A study of the general morphology, metabolism, serology and pathogenicity of the important microbial agents of communicable diseases; action of germicidal agents, sulfonamides, penicillin, streptomycin, and other antibiotics; factors in parasitic offense, and mechanisms of host defense; detailed consideration of pathogenic cocci. Two lectures and four hours laboratory each week. Sp. Two-thirds unit. Professor NOVAK and others.
325. **BACTERIOLOGY AND RELATED MICROBIOLOGY.**—Continuation of Course 324. Detailed consideration of intestinal pathogens, water and milk sanitation, anaerobes, viruses, pathogenic fungi, protozoa, spirochetes, rickettsia, and other microbial agents of disease; serological methods and routine hospital laboratory procedures applicable to diagnosis of communicable diseases. Three lectures and six hours laboratory each week. F. One unit. Associate Professor KEMPF, Assistant Professors MEYER and MUNOZ, and others.
401. **CYTOLOGY AND METABOLISM OF MICROORGANISMS.**—Bacterial structure as it is related to function and biochemical activity of the cell; influence of germicides and antibiotic substances on morphology and metabolism, nature of bacterial respirations. Lectures and necessary laboratory demonstrations. One unit. Professor NOVAK and others.
402. **IMMUNOLOGY.**—Lectures and laboratory work on general principles of serological reactions, preparation of biologicals, demonstration of immunity in animals, the allergic response, forensic serological tests, practical diagnostic methods based on serological and cutaneous reactions. Minimum eight students. W. One unit. Assistant Professor MUNOZ.
403. **VIROLOGY.**—Lectures and laboratory work on the nature of viruses, their physical, chemical, and biological characteristics; methods for propagating them in the laboratory; technique of isolating viruses; purifying, concentrating, and observing them on the electron microscope; identification by laboratory procedures; prepara-

- tion and testing of vaccines. Minimum eight students. F. One unit. Associate Professor KEMPF.
404. MYCOLOGY.—Isolation, cultivation, and morphological study of important pathogenic and saprophytic fungi. Lectures and laboratory work. Time to be arranged. One unit. Assistant Professor MEYER.
491. SEMINAR IN BACTERIOLOGY.—Presentation of timely subject material and individual research contributions. Each student is assigned a subject for presentation during the quarter. Required of all graduate students. F, W, Sp. One-half unit. Professor NOVAK, Associate Professor KEMPF, Assistant Professors MEYER and MUNOZ.
493. RESEARCH IN BACTERIOLOGY.—F, W, Sp, S. One to three units. Professors NOVAK and SHAUGHNESSY, Associate Professor KEMPF, Assistant Professors MEYER and FORSTER.

BIOLOGICAL CHEMISTRY

301. BIOLOGICAL CHEMISTRY.—Chemistry of the constituents of tissues and body fluids, and current methods for their qualitative and quantitative determination; digestion, absorption and intermediary metabolism of lipids, proteins and carbohydrates in health and disease, and the role of hormones, vitamins, and enzymes in the regulation of these processes; the application of this knowledge to the problems of disease. Lectures, conferences, and laboratory. Ten hours each week. F, W. One unit per quarter. Professor BESSEY and others.
491. SEMINAR IN BIOLOGICAL CHEMISTRY.—Student and faculty presentation of assigned subjects of current importance in biological chemistry and related fields; assigned reading. F, W, Sp. One-half unit.
493. RESEARCH IN BIOLOGICAL CHEMISTRY.—Research on problems of biological importance with members of the graduate staff. F, W, Sp, S. One to three units. Professors BESSEY and MACFADYEN, Associate Professors BERGHEIM and COLOWICK, Assistant Professor JOHNSON.

CHEMISTRY

302. ULTIMATE ANALYSIS OF ORGANIC COMPOUNDS.—Study and practice in the methods of analysis for common elements in organic compounds. Conferences and laboratory work to be arranged. One conference and minimum of eight hours laboratory per week. F, W, Sp, S. One-half unit. Professor WEBSTER, Associate Professor DAVIS.
303. ADVANCED DRUG ASSAY.—Conferences and library and laboratory work related to the methods of detecting impurities which develop; determining the quality of drugs during storage; the improvement of existing methods of assay of drugs or the development of new assays or new types of assays. Prerequisite: Chemistry 23, 241, 242, 245. F, W, Sp, S. One-half to two units. Professor WEBSTER, Associate Professor KIRCH.
308. THE CHEMISTRY OF HETEROCYCLIC COMPOUNDS.—Lectures and assigned reading and problems on the occurrence, nomenclature, reactions, and methods of synthesis of the heterocyclic compounds containing oxygen, sulfur, and nitrogen. Three lectures each week. Prerequisite: Chemistry 27 or its equivalent. Sp (alternate years). One-half unit. Professor WEBSTER.
404. PHYTOCHEMISTRY.—Lectures and library and laboratory work in the properties and suitable methods of isolation and purification of typical examples of plant constituents. Offered to groups of four or more. Prerequisite: Chemistry 241, 245. F, W, Sp, S. One to two units. Professor WEBSTER, Associate Professor KIRCH.
405. ADVANCED ORGANIC CHEMISTRY—REACTIONS.—Study of the mechanisms and ap-

plications of organic chemical reactions frequently used in synthesis. Lectures and library work. Three lectures each week. Offered to classes of four or more students. Prerequisite: One year of organic chemistry. F, W. One-half unit. Associate Professor DAVIS.

406. **ADVANCED ORGANIC CHEMISTRY — THEORY.** — Study of theories of organic chemical reactions and structure. Lectures and library work. Three lectures each week. Offered to classes of four or more students. Prerequisite: One year of organic chemistry. Sp. One-half unit. Associate Professor DAVIS.
491. **SEMINAR.** — Current problems in pharmaceutical chemistry. F, W, Sp. One-half unit.
493. **RESEARCH IN CHEMISTRY.** — One-half to three units. Professor WEBSTER, Associate Professors DAVIS and KIRCH.

CLINICAL SCIENCE

400. **PHYSIOLOGY OF SYMPTOMS.** — A systematic analysis of the principal symptoms of disease or the subjective and objective manifestations of disturbed bodily functions. Prerequisite: Anatomy, physiology, pharmacology, and pathology. Time to be arranged. One unit. Professor IVY, Associate Professor GROSSMAN.
401. **ADVANCED PHYSIOLOGY OF THE DIGESTIVE SYSTEM.** — Prerequisite: Comparative anatomy, physiology, pharmacology, and biochemistry. W. One unit. Professor IVY, Associate Professor GROSSMAN.
491. **SEMINAR IN CLINICAL SCIENCE.** — F, W, S. One-half unit. Professor IVY, Associate Professor GROSSMAN.
493. **RESEARCH IN CLINICAL SCIENCE.** — F, W, Sp, S. One to three units. Professor IVY, Associate Professor GROSSMAN.

DENTAL HISTOLOGY

401. **ADVANCED ORAL HISTOLOGY.** — Lectures, discussions, and laboratory work pertaining to special subjects and problems in Oral Histology. W, Sp. One unit. Professor SCHOUR.
493. **RESEARCH IN MICROSCOPIC ANATOMY OF TEETH AND RELATED STRUCTURES.** — W, Sp. One to three units. Professor SCHOUR.
494. **RESEARCH IN EXPERIMENTAL HISTO-PHYSIOLOGY OF TEETH AND INVESTING TISSUES.** — W, Sp. One to three units. Professor SCHOUR.

DERMATOLOGY

401. **FUNDAMENTALS OF ALLERGY.** — Fundamentals of allergy considering the nature of that alteration, the varieties of sensitization which may develop, and the immunologic properties of these in detail. F, W. One-half unit per quarter. Associate Professor ROSTENBERG.

MEDICINE

493. **RESEARCH IN MEDICINE.** — F, W, Sp, S. One to three units. Professors KEETON and FOLEY, Associate Professor BIRCH, Assistant Professor LIMARZI.

NEUROLOGY AND NEUROLOGICAL SURGERY

493. **RESEARCH IN NEUROLOGY, NEUROLOGICAL SURGERY, AND NEUROPATHOLOGY.** — F, W, Sp, S. One to three units. Professors OLDBERG, BAILEY, BUCY, and MACKAY, Associate Professor LICHTENSTEIN.

OBSTETRICS AND GYNECOLOGY

493. RESEARCH IN OBSTETRICS AND GYNECOLOGY.— Offered for graduate students planning to specialize in obstetrics and gynecology and particularly for those who expect to make teaching of obstetrics and gynecology part of their future professional work. F, W, Sp, S. One to three units. Professor FALLS.

OPHTHALMOLOGY

493. RESEARCH IN OPHTHALMOLOGY.— F, W, Sp, S. One to three units. Professor HUGHES.

ORAL AND MAXILLOFACIAL SURGERY

493. RESEARCH IN ORAL AND MAXILLOFACIAL SURGERY.— F, W, Sp, S. One to three units. Associate Professor SARNAT.

ORTHODONTIA AND PEDODONTIA

Graduate students in Orthodontia who desire to become candidates for the master's degree are required to complete four quarters of the organized orthodontia program and a minimum of one-half time for an extra quarter in research.

Graduate students in Pedodontics who desire to become candidates for the master's degree are required to complete three quarters of the organized pedodontic program and a minimum of one-half time for an extra quarter in research.

401. ORTHODONTIA.— An intensive seminar course covering four quarters and reviewing the historical background of the specialty, the classifications of malocclusion, normal growth and development of the human head, abnormal growth and development, study of clinical procedures and therapy, study of methods of analysis and diagnosis, definite clinical training, study of general research methods pertaining to the field, and the conducting of individual research projects. F, W, Sp, S. One to three units. Professor BRODIE.
402. APPLIED ANATOMY AND GROWTH OF THE HEAD.— Phylogenetic development of the head, comparative anatomical considerations of the head and dental apparatus, study of research methods employed in growth studies, application of general research methods to studies of the head. Sp. One unit. Professor BRODIE.
403. PEDODONTICS.— An intensive seminar course covering four quarters and including all problems related to dentistry for children (physical growth, emotional growth, diet and nutrition, endocrinology, health and disease, clinical management, preventive dentistry and restorative dentistry). Individual research problems are conducted during each quarter. F, W, Sp, S. One to three units. Associate Professor MASSLER.

OTOLARYNGOLOGY

493. RESEARCH IN LARYNGOLOGY, RHINOLOGY, OTOTOLOGY, AND REHABILITATION.— Special scientific work for those desiring to do productive research in any area of the specialty or to prepare for teaching. F, W, Sp, S. One to three units. Professor LEDERER.

PATHOLOGY

325. GENERAL AND SPECIFIC PATHOLOGY.— The basic principles of pathological processes, including tissue injury and repair, inflammation, circulatory disturbances, retrograde processes, and tissue responses to specific infectious agents and neoplasma, are considered in the first part of the course. In the latter part, the disease processes affecting each organ and anatomic system are considered in greater detail. The laboratory exercises are designed to correlate and interpret the gross and micro-

- scopic changes occurring in diseased tissues. Lectures, demonstrations, quiz conferences, and laboratory. Thirteen hours each week. F, W. One and one-half units per quarter. Professors BENNETT, HASS, KRAKOWER, and SAPHIR, Associate Professor GERSH, and others.
401. **EXPERIMENTAL PATHOLOGY.**—Lecture, seminar, and laboratory course in the essentials of experimental pathology. Limited to six qualified students. F. One unit. Professors BENNETT and KRAKOWER, Associate Professors GERSH and NEDZEL, Assistant Professor CATCHPOLE.
402. **HISTOCHEMISTRY.**—Lecture and laboratory course in methods and results of investigation in histochemistry. Fields covered will depend on interests of students and may include work with inorganic substances, carbohydrates, vitamins, hormones, nucleic acids, enzymes, and amino acids. Limited to six students. Sp. One unit. Associate Professor GERSH, Assistant Professor CATCHPOLE, and others.
403. **PHYSIOLOGICAL BASIS OF ENDOCRINE PATHOLOGY.**—Lecture and laboratory work in physiological mechanisms underlying abnormal endocrine structure and function. Limited to six qualified students to be selected after an interview. W. One unit. Associate Professor GERSH, Assistant Professor CATCHPOLE.
493. **INDIVIDUAL RESEARCH AND ADVANCED STUDY IN PATHOLOGY.**—Qualified graduate students who wish to do research in the department or study selected topics in pathology may register for this course after approval by the instructor and Head of the Department. F, W, Sp, S. One to three units. Professors BENNETT, KRAKOWER, and HASS, Associate Professors GERSH and NEDZEL, Assistant Professor CATCHPOLE.

PEDIATRICS

493. **RESEARCH IN PEDIATRICS.**—Graduate research is offered in the fields of physiology of the newborn, growth and development, nutrition and nutritional disturbances, metabolic and medical diseases in infants and children, pediatric hematology, and physiology of the blood-forming organs in infants and children. F, W, Sp, S. One to three units. Professor PONCHER.

PHARMACOGNOSY

301. **DRUG PLANT CULTIVATION.**—The cultivation of medicinal plants including soils, plant growth, propagation, plant care, pest control, equipment, production, harvesting, drying, storing, and marketing. Four lectures or recitations each week. F, Sp. One unit. Professors SERLES and VOIGT.
302. **DRUG PLANT CULTIVATION (FIELD AND GREENHOUSE).**—Practical work in propagation, planting, cultivating, harvesting, and drying drug plants at the Drug Plant Experiment Station. Sp, S. One to three units. Professor VOIGT.
334. **CHEMICAL MICROSCOPY.**—Morphology of crystals, optical properties of crystals, and the use of the petrographical microscope in the examination of crystals; detection and separation of the elements of the eight periodic groups; common anions; organic compounds with special emphasis on the synthetic pharmaceuticals, the alkaloids, glucosides. Two lectures and two three-hour laboratory periods each week. F, W, Sp. One unit. Professors MAHER and VOIGT.
343. **MICROSCOPY OF FOODS.**—Microscopical study of foods including cereal products, spices and condiments, oil seeds and oil cakes, legumes, nuts, fruit and fruit products, vegetables, tea, coffee, cacao, etc.; special reference to legal standards governing these foods. Two lectures and two three-hour laboratory periods each week. F, W, Sp. One unit. Professors MAHER and VOIGT.
344. **MICROSCOPY OF TECHNICAL PRODUCTS.**—Application of microscopical and microchemical methods to the identification of fibers, textiles, papers, woods, plastics, and other technical and industrial products. One lecture and one three-hour laboratory period each week. F, W, Sp. One-half unit. Professors MAHER and VOIGT.

403. **ANATOMY AND PHYSIOLOGY OF THE VASCULAR PLANTS.**—An advanced course including the microscopic structure of vascular plants with particular attention to the development and evolution of the vascular system in the root, stem, and leaf; survey of the entire field of plant physiology. Four lectures or recitations each week. F, W, Sp. One unit. Professor VOIGT.
404. **TAXONOMY AND GENETICS OF FLOWERING PLANTS.**—A special study of the taxonomy of natural groups involving systematic principles and practices, rules of nomenclature, systems of classification together with the collection, identification, and preservation of drug plant specimens. The instruction in genetics is designed to acquaint the student with the fundamental principles in the science of genetics. Four lectures or recitations each week and occasional field trips. F, W, Sp. One unit. Professor VOIGT.
436. **MICROSCOPIC TECHNIC.**—Collection, preservation, and preparation of plant and animal material for microscopic examination; methods of hardening, fixing, imbedding, sectioning, staining, and mounting; special microscopic methods and photo-micrography. One lecture and two three-hour laboratory periods each week. F, W, Sp. One-half unit. Professor VOIGT.
442. **ADVANCED PHARMACOGNOSY.**—Special divisions of Pharmacognosy, including pollen grains and other vegetable and animal matter related to allergy; the pharmacognosy of the glandular products; vegetable insecticides; advanced quantitative microscopy and ultra-violet microscopy of drugs and medicinal plants. Two lectures or recitations and two three-hour laboratory periods each week. F, W, Sp. One unit. Professor VOIGT.
445. **MICROCHEMISTRY OF PLANTS.**—A laboratory study of plants based upon their important constituents; includes the microisolation and identification of constituents from plant material; special emphasis placed upon plants yielding drugs. Two three-hour laboratory periods each week. F, W, Sp. One-half unit. Professors MAHER, WEBSTER, and VOIGT.
491. **PHARMACOGNOSY SEMINAR.**—Reviews, reports, and discussions covering the latest advances in pharmacognosy, phytochemistry, genetics, and other related subjects. F, W, Sp. One-half unit per quarter for not more than two quarters. Professor MAHER and staff.
493. **RESEARCH IN PHARMACOGNOSY.**—Problems may be selected in any division of pharmacognosy including histological pharmacognosy, microchemical pharmacognosy, the chemistry of drug constituents, the standardization of drugs, drug plant cultivation, and breeding or food microscopy. F, W, Sp, S. One to three units. Professors SERLES, WEBSTER, VOIGT, and MAHER.

PHARMACOLOGY

325. **PHARMACOLOGY, TOXICOLOGY, AND CHEMOTHERAPY.**—Lectures and quizzes, W, Sp; three-hour weekly laboratory, W; two-hour weekly demonstration, Sp. Prerequisite: Acceptable courses in biochemistry and physiology. Two-thirds unit per quarter. Professor PFEIFFER and staff.
401. **BIOMETRICS AND APPLIED STATISTICS.**—An introduction to the rational use of simple statistical methods in the planning of experiments and evaluation of results; emphasis will be placed on the practical application of statistics as working tools rather than discussion of the mathematical theory of statistics. F. One-half unit. Assistant Professor LAST.
491. **PHARMACOLOGICAL SEMINAR.**—Weekly seminar, presentation of original research in pharmacology, toxicology, and chemotherapy. F, W, Sp, S. One-half unit. Professor PFEIFFER and staff.
493. **RESEARCH IN CHEMOTHERAPY, PHARMACODYNAMICS, CELLULAR PHARMACOLOGY, EXPERIMENTAL THERAPEUTICS, AND TOXICOLOGY.**—F, W, Sp, S. One to three units. Professors PFEIFFER and CAMP, Assistant Professors UNNA and LAST.

PHARMACY

400. HOSPITAL PHARMACY. — Study and practice of the administrative and operational aspects of hospital pharmacies, including organization of staff, business administration, cost accounting, location, equipment, purchasing, inventory control, storage, therapeutic procedure, and services to floors. One lecture and nine hours practice per week. F. One unit. Professors SERLES, FOSS, and BENTON.
401. MANUFACTURING CONTROL. — Specifications, inspection, and sampling of drugs, chemicals, containers, closures, and packings, etc.; reproduction of standard working formulas; quality and quantity of manufacturing processes; periodical inspection of finished goods; sanitary standards and Federal Food, Drug, and Cosmetic Act. Two lectures and six hours laboratory per week. F, W. One unit per quarter. Professors SERLES and Foss.
402. MANUFACTURING PHARMACY. — Lectures and laboratory work on the unit processes and equipment used in the preparation of parenteral products, tablets, powders, extracts, suppositories, ointments, gels, emulsions, suspensions, and liquid preparations. One lecture and nine hours laboratory per week. F, W, Sp. One unit per quarter for not more than three quarters. Professors SERLES, FOSS, and BENTON.
403. MANUFACTURING PLANNING. — Lectures on the administrative and operational aspects of pharmaceutical manufacturing, including planning and production control, purchasing, receiving, warehousing, distribution, inventory control, plant engineering, and cost accounting. Two lectures and six hours laboratory per week. F, Sp. One unit per quarter for not more than two quarters. Professors SERLES and Foss.
491. SEMINAR IN PHARMACY. — Presentation of individual research contributions and of topics related to Pharmacy. Each student is assigned a subject for presentation during the quarter. F, W, Sp. One-half unit per quarter for not more than two quarters. Professors SERLES, FOSS, and BENTON.
493. RESEARCH IN PHARMACY. — F, W, Sp, S. One to three units. Professors SERLES, FOSS, and BENTON.

PHYSICAL MEDICINE

493. RESEARCH IN PHYSICAL MEDICINE. — Research in physical medicine. Open to physicians who, in addition to their medical degree, have completed at least one year of internship, and who plan to specialize in the field of physical medicine. F, W, Sp, S. One to three units. Professor KENDELL.

PHYSIOLOGY

324. HUMAN PHYSIOLOGY. — Physiology of blood, circulation, and respiration. Lectures, quiz conferences, demonstrations, and laboratory. Sp. One unit. Professors WAKERLIN, BACHEM, and REED, Associate Professor INGRAHAM, Assistant Professors WHITEHORN, SCHILLER, and PAINTER.
325. HUMAN PHYSIOLOGY. — Continuation of Physiology 324. Physiology of muscle and nerve, central nervous system, and senses. Lectures, quiz conferences, demonstrations, and laboratory. F. One unit. Professors WAKERLIN, BACHEM, and REED, Associate Professor INGRAHAM, Assistant Professors WHITEHORN, SCHILLER, and PAINTER.
326. HUMAN PHYSIOLOGY. — Continuation of Human Physiology 325. Physiology of digestion, excretion, endocrines, nutrition, metabolism, and heat regulation. Lectures, quiz conferences, demonstrations, and laboratory. W. One unit. Professors WAKERLIN, BACHEM, and REED, Associate Professor INGRAHAM, Assistant Professors WHITEHORN, SCHILLER, and PAINTER.
491. SEMINAR IN SELECTED FIELDS OF PHYSIOLOGY. — Designed to meet the needs of students desiring advanced detailed knowledge of a limited field of physiology. Each quarter different fields are selected and announced in advance. Subjects are blood, heart, circulation, muscle, gastro-intestinal tract, kidney, endocrinology, metabolism

and nutrition, growth, and neurophysiology. F, W, Sp, S. One unit. Professors WAKERLIN, BACHEM, and REED, Associate Professor INGRAHAM, Assistant Professors WHITEHORN and PAINTER.

492. **PHYSIOLOGY SEMINAR.** — F, W, Sp. One-half unit. Professors WAKERLIN, BACHEM, and REED, Associate Professor INGRAHAM, Assistant Professors WHITEHORN and PAINTER.

493. **RESEARCH IN PHYSIOLOGY.** — F, W, Sp, S. One to three units. Professors WAKERLIN and REED, Associate Professor INGRAHAM, Assistant Professors WHITEHORN and PAINTER.

PSYCHIATRY

493. **RESEARCH IN PSYCHIATRY.** — Investigation of problems concerning psychiatry through laboratory, clinical, and sociological approaches; neuroanatomical, neurophysiological, biochemical, and psychological means are employed to throw light on the clinical problems of etiology, diagnosis, prevention, and treatment of behavioral disorders in man. Problems are not screened on the basis of apparent promise of practical application of results in the socio-clinical areas. The chief object is the exploration of the foundations of psychiatry. F, W, Sp, S. One to three units. Professors GERTY and McCULLOCH, Associate Professors MEDUNA and CARMICHAEL.

494. **RESEARCH IN JUVENILE BEHAVIOR.** — Research on some particular aspect of juvenile behavior, either in terms of etiology, symptomatology, or treatment, or possibly a combination of these. F, W, Sp, S. One to three units. Professor GERTY.

RADIOLOGY

493. **RESEARCH IN RADIOLOGY.** — Research in the physical and biological aspects of radiography and radiotherapy using such instruments as monochromatic radiations, high intensity radiations, radioactive isotopes, and betatron. F, W, Sp, S. One to three units. Professor HARVEY.

SURGERY

493. **RESEARCH IN SURGERY.** — Investigation of problems in Surgery, including laboratory and clinical work. F, W, Sp, S. One to three units. Professors COLE and PUESTOW, Associate Professors HERROLD, DETAKATS, and VERMEULEN.

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